Measure Information Template (JH-5)

Category: Nonresidential – mechanical; nonresidential – lighting.

Description: Add new section 125 with completion and commissioning requirements consistent with ASHRAE/IESNA Standard 90.1, Section 6.2.5, and/or Seattle Energy Code Section 1416 and 1513.7.
(1) Title 24, Part 6, Section 125. Completion and Commissioning Requirements:

Require completion and commissioning for HVAC systems per ASHRAE/IESNA Standard 90.1, Section 6.2.5 and/or Seattle Energy Code Section 1416. *Some performance verification needs to be done to ensure that the expected energy savings are being achieved.*

Require completion and commissioning for automatic lighting controls per Seattle Energy Code Section 1513.7. *Some performance verification needs to be done to ensure that the expected energy savings are being achieved.*

Code Language Proposal:

- Title 24, Part 6, Section 125. Completion and Commissioning Requirements (page 67).

Title 24, Part 6, SECTION 125
– COMPLETION AND COMMISSIONING REQUIREMENTS

125 Mechanical Systems Commissioning and Completion Requirements

125.1 General. Commissioning is a systematic process of verification and documentation that ensures that the selected building systems have been designed, installed, and function properly, efficiently, and can be maintained in accordance with the contract documents in order to satisfy the building owner's design intent and operational requirements. Drawing notes shall require commissioning and completion requirements in accordance with this section. Drawing notes may refer to specifications for further requirements.

125.1.1 Simple Mechanical Systems. To qualify as a simple system, systems shall be one of the following:

a. Air cooled, constant volume packaged equipment, which provide heating, cooling or both, and require only external connection to duct work and energy services with cooling capacity of 135,000 Btu/h or less.

b. Air cooled, constant volume split systems, which provide heating, cooling or both, with cooling capacity of 84,000 Btu/h or less.

c. Heating only systems which have a capacity of less than 5,000 cfm or which have a minimum outside air supply of less than 70% of the total air circulation.

For simple mechanical systems and for warehouses and semi-heated spaces, commissioning shall include, as a minimum:

a. A Commissioning Plan,

b. System Testing and Balancing,

c. Controls Functional Performance Testing,

d. A Preliminary Commissioning Report,

e. Post Construction Documentation in the form of O&M and Record Drawing Review, and

f. A Final Commissioning Report.

125.1.2 All Other Mechanical Systems. For all other mechanical systems, commissioning shall include, as a minimum:

a. A Commissioning Plan,

b. System Testing and Balancing,

c. Equipment Functional Performance Testing,

d. Controls Functional Performance Testing,

e. A Preliminary Commissioning Report,

f. Post Construction Documentation (all), and

g. A Final Commissioning Report.

125.2 Commissioning Requirements

125.2.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

125.2.2 Commissioning Plan. The Plan shall require tests mandated by this section be performed and the results recorded. The Plan shall require preparation of preliminary and final reports of test procedures and results as described herein. At a minimum, the Plan shall identify the following for each test:

a. A detailed explanation of the original design intent.

b. Equipment and systems to be tested, including the extent of tests,

c. Functions to be tested (for example calibration, economizer control, etc.),

d. Conditions under which the test shall be performed (for example winter and summer design conditions, full outside air, etc.), and

e. Measurable criteria for acceptable performance.

125.2.3 Systems Balancing

125.2.3.1 General. Construction documents shall require that all HVAC systems be balanced in accordance with generally accepted engineering standards. Air and water flow rates shall be measured and adjusted to deliver final flow rates within 10% of design rates, except variable flow distribution systems need not be balanced upstream of the controlling device (for example, VAV box or control valve). Construction documents shall require a written balance report be provided to the owner. Drawing notes may refer to specifications for further systems balancing requirements.

125.2.3.2 Air Systems Balancing. Air systems shall be balanced in a manner to first minimize throttling losses then, for fans with system power of greater than 1 hp, fan speed shall be adjusted to meet design flow conditions.

125.2.3.3 Hydronic Systems Balancing: Hydronic systems shall be proportionately balanced in a manner to first minimize throttling losses, then the pump impeller shall be trimmed or pump speed shall be adjusted to meet design flow conditions. Each hydronic system shall have either the ability to measure pressure across the pump, or test ports at each side of each pump.

EXCEPTIONS:

1. Pumps with pump motors of 10 hp or less.

2. When throttling results in no greater than 5% of the nameplate horsepower draw above that required if the impeller was trimmed.

125.2.4 Functional Performance Testing

125.2.4.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

125.2.4.2 Equipment/Systems Testing. Functional Performance Testing shall demonstrate the correct installation and operation of each component, system, and system-to-system intertie relationship in accordance with approved plans and specifications. This demonstration is to prove the operation, function, and maintenance serviceability for each of the Commissioned systems. Testing shall include all modes of operation, including:

a. All modes as described in the Sequence of Operation,

b. Redundant or automatic back-up mode,

c. Performance of alarms, and

d. Mode of operation upon a loss of power and restored power.

125.2.4.3 Controls Testing: HVAC control systems shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate

in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accordance with approved plans and specifications.

125.2.5 Post Construction Commissioning

125.2.5.1 General: Construction documents shall require post construction commissioning be provided to the building owner prior to date of final acceptance. Drawing notes may refer to specifications for further commissioning requirements. Post construction commissioning shall include, as a minimum, review and approval of Operation and Maintenance Materials, Record Drawings, and Systems Operational Training.

125.2.5.2 Operation and Maintenance Materials: The O&M Materials shall be in accordance with industry accepted standards and shall include, at a minimum, the following:

a. Submittal data stating equipment size and selected options for each piece of equipment requiring maintenance.

b. Operation and maintenance manuals for each piece of equipment requiring maintenance, except equipment not furnished as part of the project. Required routine maintenance actions shall be clearly identified.

c. Names and addresses of at least one service agency.

d. HVAC controls system maintenance and calibration information, including wiring diagrams, schematics, and control sequence descriptions. Desired or field determined set points shall be permanently recorded on control drawings at control devices, or, for digital control systems, in programming comments.

e. A complete written narrative of how each system and piece of equipment is intended to operate including:

i. A detailed explanation of the original design intent.

ii. The basis of design (how the design was selected to meet the design intent).

iii. A detailed explanation of how new equipment is to interface with existing equipment or systems (where applicable).

iv. Suggested control set points.

NOTE: Sequence of Operation is not acceptable as a narrative for this requirement.

125.2.5.3 Record Drawings: Record drawings shall include, as a minimum, the location and performance data on each piece of equipment, general configuration of duct and pipe distribution system, including sizes, and the terminal air and water design flow rates of the actual installation.

125.2.5.4 Systems Operational Training: The training of the appropriate maintenance staff for each equipment type and or system shall include, as a minimum, the following:

a. System/Equipment overview (what it is, what it does and which other systems and or equipment does it interface with).

b. Review of the available O&M materials.

c. Review of the Record Drawings on the subject system/equipment.

d. Hands-on demonstration of all normal maintenance procedures, normal operating modes, and all emergency shutdown and start-up procedures.

125.2.6 Commissioning Reports

125.2.6.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements.

125.2.6.2 Preliminary Commissioning Report: A preliminary report of commissioning test procedures and results shall be completed and provided to the Owner. The Preliminary Commissioning Report shall identify:

a. Deficiencies found during testing required by this section which have not been corrected at the time of report preparation and the anticipated date of correction.

b. Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.

c. Climatic conditions required for performance of the deferred tests, and the anticipated date of each deferred test.

125.2.6.3 Final Commissioning Report: A complete report of test procedures and results shall be prepared and filed with the Owner. The Final Commissioning Report shall identify:

a. Results of all Functional Performance Tests.

b. Disposition of all deficiencies found during testing, including details of corrective measures used or proposed.

c. All Functional Performance Test procedures used during the commissioning process including measurable criteria for test acceptance, provided herein for repeatability.

EXCEPTION: Deferred tests which cannot be performed at the time of report preparation due to climatic conditions.

125.3 Acceptance Requirements

125.3.1 General. Drawing notes shall require commissioning in accordance with this section. Drawing notes may refer to specifications for further commissioning requirements. Buildings or portions thereof, required by this Code to comply with this section, shall not be issued the following certificates until such time that the building official determines that the appropriate commissioning requirements dictated by this section have been completed and provided.

125.3.2 Acceptance: Buildings or portions thereof, required by this Code to comply with this section, shall not be issued a final certificate of occupancy until such time that the building official determines that the preliminary commissioning report required by this section has been completed.

125.4 Commissioning Requirements for Automatic Lighting Controls: For lighting controls which include daylight or occupant sensing automatic controls, automatic shut-off controls, occupancy sensors, or automatic time switches, the lighting controls shall be tested to ensure that control devices, components, equipment and systems are calibrated, adjusted and operate in accordance with approved plans and specifications. Sequences of operation shall be functionally tested to ensure they operate in accordance with approved plans and specifications. A complete report of test procedures and results shall be prepared and filed with the owner. Drawing notes shall require commissioning in accordance with this paragraph.

Benefits: Additional energy savings with performance verification to ensure that the expected energy savings are being achieved.

Environmental Impact: Energy savings.

Type of Change: Mandatory.

Measure Availability and Cost: Completion and commissioning is standard practice for some firms but not all. Completion and commissioning is required by (1) ASHRAE Standard 90.1, and (2) the Seattle Energy Code.

Useful Life, Persistance and Maintenance: Same as current systems.

Performance Verification: New.

Cost Effectiveness: Completion and commissioning is standard practice for some firms but not all. Completion and commissioning is required by (1) ASHRAE Standard 90.1, and (2) the Seattle Energy Code.

Analysis Tools: NA.

Relationship to Other Measures: NA.

Bibliography and Other Research: (1) ASHRAE/IESNA Standard 90.1, Section 6.2.5, and (2) Seattle Energy Code, Section 1416 and 1513.7.